

CLAIMS

1. A quick release mechanism comprising:

5 a tool comprising a drive stud comprising an out-of-round drive portion, an adjacent portion, and a passageway extending obliquely with respect to a longitudinal axis defined by the drive stud between a first end at the drive portion and a second end at the adjacent portion, said out-of-round portion shaped to fit within a tool attachment to apply torque to the tool attachment;

10 a locking element slidably received in the passageway to slide between a tool attachment engaging position and a tool attachment release position;

a coil spring extending around the adjacent portion, said spring comprising a first end coupled with the locking element to bias the locking element to the tool engaging position, and a second end; and

15 a shoulder formed by the adjacent portion and facing the spring, said shoulder forming a transition between a radially outer surface and a radially inner surface, wherein the shoulder is interposed between the radially outer surface and the spring;

20 a ring disposed around the adjacent portion between the second end of the spring and the shoulder;

a collar extending around the spring and the ring;

a second ring extending around the adjacent portion between the locking element and the first end of the spring, said second ring transferring biasing forces from the spring to the locking element;

25 said spring extending farther than said radially outer surface radially away from the longitudinal axis.

2. (Cancelled)

3. A quick release mechanism comprising:

a tool comprising a drive stud comprising an out-of-round drive portion, an adjacent portion, and a passageway extending obliquely with respect to a longitudinal axis defined by the drive stud between a first end at the drive portion and a second end at the adjacent portion, said out-of-round portion
5 shaped to fit within a tool attachment to apply torque to the tool attachment;

a locking element slidably received in the passageway to slide between a tool attachment engaging position and a tool attachment release position;

a coil spring extending around the adjacent portion, said spring
10 comprising a first end coupled with the locking element to bias the locking element to the tool engaging position, and a second end; and

an integral raised stop extending radially outwardly from the adjacent portion of the drive stud;

a ring extending around the adjacent portion between the
15 locking element and the first end of the spring, said ring transferring biasing forces from the spring to the locking element;

a collar extending around the spring and the ring;

said spring reacting against said raised stop and extending farther than said raised stop radially away from the longitudinal axis.

20 4. (Cancelled)

5. The invention of Claim 1 wherein the ring centers the collar on the tool as the collar moves along the longitudinal direction relative to the drive stud and the ring.

6. (Cancelled)

25 7. The invention of Claim 1 wherein the collar comprises a ledge that engages the ring on a side of the ring opposite the spring.

8. The invention of Claim 1 wherein the spring comprises a coiled wire characterized by a wire center, and wherein the wire center of a portion

of the spring facing the shoulder extends farther than said radially outer surface radially away from the longitudinal axis.

5 9. The invention of Claim 1 or 3 further comprising a releasing spring biasing the locking element toward the tool attachment releasing position.

10. The invention of Claim 1 wherein the second end of the spring bears directly on the ring, and wherein the ring bears directly on the shoulder.

11. The invention of Claim 1 wherein the ring is symmetrical about a mid-plane oriented transverse to the longitudinal axis.

10 12. The invention of Claim 1 wherein a portion of the spring facing the shoulder defines an inner spring diameter and an outer spring diameter, wherein the radially outer surface defines a surface diameter adjacent the spring, and wherein the surface diameter is greater than the inner spring diameter and less than the outer spring diameter.

15 13. The invention of Claim 3 wherein a portion of the spring facing the raised stop defines an inner spring diameter and an outer spring diameter, wherein the raised stop defines a stop diameter adjacent the spring, and wherein the stop diameter is greater than the inner spring diameter and less than the outer spring diameter.

20 14. The invention of Claim 3 wherein the raised stop comprises a shoulder.

15. The invention of Claim 3 wherein the raised stop comprises an upset portion of the drive stud.

25 16. The invention of Claim 3 wherein the raised stop comprises an element secured to the drive stud.

17. The invention of Claim 16 wherein the element comprises a material selected from the group consisting of metals and epoxies.

18. A quick release mechanism comprising:

5 a tool comprising a drive stud comprising an out-of-round drive portion, an adjacent portion, and a passageway extending obliquely with respect to a longitudinal axis defined by the drive stud between a first end at the drive portion and a second end at the adjacent portion, said out-of-round portion shaped to fit within a tool attachment to apply torque to the tool attachment;

10 a locking element slidably received in the passageway to slide between a tool attachment engaging position and a tool attachment release position; and

a coil spring extending around the adjacent portion, said spring comprising a first end coupled with the locking element to bias the locking element to the tool engaging position, and a second end;

15 wherein the locking element comprises a first end shaped to engage the tool attachment, an intermediate portion, and a second end, wherein the second end comprises a smaller diameter than a diameter of the intermediate portion.

19. The invention of claim 18 further comprising:

20 an integral raised stop extending radially outwardly from the adjacent portion of the drive stud;

a collar extending around the spring and the ring;

25 a second ring extending around the adjacent portion between the locking element and the first end of the spring, said second ring transferring biasing forces from the spring to the locking element.

20. A quick release mechanism comprising:

a tool comprising a drive stud comprising an out-of-round drive portion, an adjacent portion, an upset portion extending radially outwardly from the adjacent portion, and a passageway extending obliquely with respect to a longitudinal axis defined by the drive stud between a first end at the drive portion and a second end at the adjacent portion, the out-of-round portion shaped to fit within a tool attachment to apply torque to the tool attachment;

a locking element slidably received in the passageway to slide between a tool attachment engaging position and a tool attachment release position; and

a coil spring extending around the adjacent portion, the spring comprising a first end coupled with the locking element to bias the locking element to the tool engaging position, and a second end reacting against the upset portion.

21. The invention of Claim 20, wherein the upset portion extends radially outwardly from the adjacent portion of the drive stud, and wherein the spring extends farther than the upset portion radially away from the longitudinal axis.

22. The invention of Claim 20 further comprising a releasing spring biasing the locking element toward the tool attachment releasing position.

23. The invention of Claim 20 wherein a portion of the spring facing the upset portion defines an inner spring diameter and an outer spring diameter, wherein the upset portion defines a stop diameter adjacent the spring, and wherein the stop diameter is greater than the inner spring diameter and less than the outer spring diameter.

24. The invention of Claim 20 further comprising a ring disposed around the adjacent portion between the second end of the spring and the upset portion.

25. The invention of Claim 24 wherein the ring is symmetrical about a mid-plane oriented transverse to the longitudinal axis.

5 26. The invention of Claim 24 wherein the second end of the spring bears directly on the ring, and wherein the ring bears directly on the upset portion.

27. The invention of Claim 24 further comprising a collar extending around the spring and the ring.

10 28. The invention of Claim 27 wherein the ring centers the collar on the tool as the collar moves along the longitudinal direction relative to the drive stud and the ring.

29. The invention of Claim 27 further comprising a second ring extending around the adjacent portion between the locking element and the first end of the spring, the second ring transferring biasing forces from the spring to the locking element.

15 30. The invention of Claim 29 wherein the collar comprises a ledge that engages the second ring on a side of the second ring opposite the spring.

31. The invention of Claim 20 further comprising a collar extending around the spring.

20 32. The invention of Claim 24 further comprising a second ring extending around the adjacent portion between the locking element and the first end of the spring, the second ring transferring biasing forces from the spring to the locking element.

33. A quick release mechanism comprising:

a tool comprising a drive stud comprising an out-of-round drive portion, an adjacent portion, and a passageway extending obliquely with respect to a longitudinal axis defined by the drive stud between a first end at the drive portion and a second end at the adjacent portion, said out-of-round portion shaped to fit within a tool attachment to apply torque to the tool attachment;

a locking element slidably received in the passageway to slide between a tool attachment engaging position and a tool attachment release position;

a coil spring extending around the adjacent portion, said spring comprising a first end coupled with the locking element to bias the locking element to the tool engaging position, and a second end; and

a shoulder formed by the adjacent portion and facing the spring, said shoulder forming a transition between a radially outer surface and a radially inner surface, wherein the shoulder is interposed between the radially outer surface and the spring, wherein the spring axially overlaps the radially inner surface;

a ring disposed around the adjacent portion between the second end of the spring and the shoulder;

said spring extending farther than said radially outer surface radially away from the longitudinal axis.

34. A quick release mechanism comprising:

a tool comprising a drive stud comprising an out-of-round drive portion, an adjacent portion, and a passageway extending obliquely with respect to a longitudinal axis defined by the drive stud between a first end at the drive portion and a second end at the adjacent portion, said out-of-round portion shaped to fit within a tool attachment to apply torque to the tool attachment;

a locking element slidably received in the passageway to slide between a tool attachment engaging position and a tool attachment release position;

5 a coil spring extending around the adjacent portion, said spring comprising a first end coupled with the locking element to bias the locking element to the tool engaging position, and a second end; and

10 a shoulder formed by the adjacent portion and facing the spring, said shoulder forming a transition between a radially outer surface and a radially inner surface, wherein the shoulder is interposed between the radially outer surface and the spring, wherein the spring axially overlaps the radially inner surface;

said spring reacting against said shoulder and extending farther than said radially outer surface radially away from the longitudinal axis;

15 wherein a portion of the spring facing the shoulder defines an inner spring diameter and an outer spring diameter, wherein the radially outer surface defines a surface diameter adjacent the spring, and wherein the surface diameter is greater than the inner spring diameter and less than the outer spring diameter.

20 35. A quick release mechanism comprising:

25 a tool comprising a drive stud comprising an out-of-round drive portion, an adjacent portion, and a passageway extending obliquely with respect to a longitudinal axis defined by the drive stud between a first end at the drive portion and a second end at the adjacent portion, said out-of-round portion shaped to fit within a tool attachment to apply torque to the tool attachment;

a locking element slidably received in the passageway to slide between a tool attachment engaging position and a tool attachment release position;

30 a coil spring extending around the adjacent portion, said spring comprising a first end coupled with the locking element to bias the locking element to the tool engaging position, and a second end; and

an integral raised stop extending radially outwardly from the adjacent portion of the drive stud, said raised stop adjacent a radially inner surface, wherein the spring axially overlaps the radially inner surface;

said spring reacting against said raised stop and extending farther than said raised stop radially away from the longitudinal axis;

wherein a portion of the spring facing the raised stop defines an inner spring diameter and an outer spring diameter, wherein the raised stop defines a stop diameter adjacent the spring, and wherein the stop diameter is greater than the inner spring diameter and less than the outer spring diameter.

36. The invention of Claim 33 further comprising a collar extending around the spring and the ring.

37. The invention of Claim 36 wherein the ring centers the collar on the tool as the collar moves along the longitudinal direction relative to the drive stud and the ring.

38. The invention of Claim 36 further comprising a second ring extending around the adjacent portion between the locking element and the first end of the spring, said second ring transferring biasing forces from the spring to the locking element.

39. The invention of Claim 38 wherein the collar comprises a ledge that engages the second ring on a side of the second ring opposite the spring.

40. The invention of Claim 33 or 34 wherein the spring comprises a coiled wire characterized by a wire center, and wherein the wire center of a portion of the spring facing the shoulder extends farther than said radially outer surface radially away from the longitudinal axis.

41. The invention of Claim 33, 34 or 35 further comprising a releasing spring biasing the locking element toward the tool attachment releasing position.

42. The invention of Claim 33 wherein the second end of the spring bears directly on the ring, and wherein the ring bears directly on the shoulder.

43. The invention of Claim 33 wherein the ring is symmetrical about a mid-plane oriented transverse to the longitudinal axis.

5 44. The invention of Claim 35 wherein the raised stop comprises a shoulder.

45. The invention of Claim 35 wherein the raised stop comprises an upset portion of the drive stud.

10 46. The invention of Claim 35 wherein the raised stop comprises an element secured to the drive stud.

47. The invention of Claim 46 wherein the element comprises a material selected from the group consisting of metals and epoxies.

15 48. The invention of Claim 33 wherein a portion of the spring facing the shoulder defines an inner spring diameter and an outer spring diameter, wherein the radially outer surface defines a surface diameter adjacent the spring, and wherein the surface diameter is greater than the inner spring diameter and less than the outer spring diameter